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ABSTRACT

This study investigated the spontaneous use of verbal mediators in discrimination learning, the transfer of mediators to a free recall task, and the effects of a pretraining task on performance. The discrimination tasks required nursery school children (80) to: (1) sort three instances each of two different concepts in a conceptually consistent fashion, (2) sort three conceptually-related and three unrelated stimuli into groups, and (3) sort six unrelated stimuli into two predefined groups. The results indicated that the subjects spontaneously utilized the conceptual mediators on the discrimination task. However, they did not use them together with alternate discriminative cues present in the list. The subjects also transferred the mediators to the free recall task (where recall for conceptually related items was greater for conceptually--related than for unrelated items). Pretraining facilitated discrimination learning but had no effect on recall. (Author/SET)

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MEDIATOR USE AND TRANSFER IN DISCRIMINATION LEARNING AND FREE RECALL[1]

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Abstract

The spontaneous use of verbal mediators in discrimination learning and the transfer of mediators to a new (free recall) task were studied. Also, the effects on performance of a pretraining task (designed to prime the use of the mediators) were assessed.

The discrimination tasks required nursery school children to sort either three instances each of two different concepts in a conceptually consistent fashion, to sort three conceptually-related and three unrelated stimuli into groups, or to sort six unrelated stimuli into two predefined groups. The results indicated that the Ss spontaneously utilized the conceptual mediators on the discrimination task. However, they did not use them together with alternate discriminative cues present in the list. The Ss also transferred the mediators to the free recall task (where recall for conceptually related items was greater for conceptually-related than for unrelated items). Pretraining facilitated discrimination learning but had no effect on recall.

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A number of recent studies have been concerned with identifying the conditions under which children do produce and use mediators in performance (Coates & Hartup, 1969; Keeney, Cannizzo, & Flavell, 1967; Kingsley & Hagen, 1969; Moeley, Olson, Halwes, & Flavell, 1969). The evidence suggests that young children, although not characterized by the spontaneous production and use of mediators, can be primed to use them in task performance (e.g., Flavell, 1970). Further, the E-induced use of mnemonics (e.g., a verbal-rehearsal strategy) has been found to enhance the performance of young (e.g., first grade) children even though the effects of such priming may not be long-lasting (Keeney, Cannizzo, & Flavell, 1967). One of the present concerns was with identifying other stimulus and task factors which influence the use of mediators in task performance, namely, the degree to which discrimination learning is affected by the presence of multiple cues for discrimination.

Prior studies have been concerned with Ss' use or non-use of mediators in acquisition, as in free recall (e.g., Laurence, 1967; Nelson, 1969); or with the transfer of mediators between tasks which involve essentially identical task requirements, as in the reversal-shift paradigm (e.g., Kendler, Kendler, & Marken, 1969). A second purpose of the present study was to study the transfer of mediators from a discrimination task to a free recall task.

The nature of these questions is clarified upon examination of the experimental tasks used in the study. There were four main treatment groups differentiated by the stimulus materials used in the discrimination tasks. The materials in the Conceptual task consisted of three pictures from each of two different concepts; the Unrelated task consisted of six conceptually-unrelated pictures. The two Mixed treatments (differentiated below) involved three pictures representing a familiar concept and three related pictures.

In each of the four treatments, Ss were required to identify the three pictures in the list which had a star pasted on the reverse side. The Conceptual treatment had the star associated with each of the instances of one of the concepts. In the Unrelated treatment the star was associated with three randomly selected pictures in the list. In the First-Mixed treatment the star was associated with the three related pictures in the list, whereas the star was associated with the three unrelated pictures in the list for the Second-Mixed treatment.

The rate of learning was expected to be identical among the four treatments if Ss did not use the conceptual cues as aids in list mastery, whereas inferior performance was expected in the Unrelated treatment if Ss used the available conceptual cues for learning in the Conceptual and two Mixed treatments. Finally, comparisons in performance between the First-Mixed and Second-Mixed treatments provided evidence concerning the effects upon learning of having the discriminative cues (conceptual cues and star) correlated and redundant (First-Mixed treatment) as opposed to having one of the cues associated with each of the sets of stimuli in the list.

These questions were examined under conditions where the children were or were not given a short pretraining task designed to enhance the use of mediators in performance. The inclusion of the pretraining treatment also permitted the assessment of the relative degree of transfer between tasks (Pretraining and Discrimination) which involve only a change in response requirements (sorting and discrimination).

Two types of information are available from the test of free recall which followed practice on the discrimination task; i.e., the comparisons of recall between conceptually-related and unrelated stimulus sets examine the magnitude of mediator transfer, and, whether recall is facilitated by the presence of one or more sets of conceptually-related items in the list.

Method

Subjects

The Ss were 40 boys and 40 girls enrolled at the University of Illinois preschool at the Children's Research Center. Their ages ranged from 4.0 to 5.2 years with a mean age of 4.66. The boys and girls were ranked in terms of chronological age and then randomly assigned (with the restriction of equal Ns) to treatment conditions in the order of oldest to youngest. There were five boys and five girls in each of the eight treatments.

Materials

Two groups of three conceptually-related and conceptually-unrelated pictures were selected. The pictures were 1 in. by 1 in. (approx.) line drawings from the Peabody Picture Vocabulary Test. All pictures were selected on the basis of their familiarity to young children and their one word verbal labels. Two sets of conceptual items were selected from each of the categories

"animal" and "vegetable"; namely, horse, pig, rabbit and corn, pumpkin, carrot. The unrelated items were scissors, bike, and table for the first group and bell, key, and ball for the second group.

The stimuli were mounted on 2 x 3 index cards and were arranged to form lists representing the four experimental treatments, with two alternate lists representing each treatment. The Conceptual lists involved three pictures each from the animal and vegetable stimulus groups, with a star pasted on the back of the animal pictures for one list and on the back the vegetable pictures for the second list, respectively.

The lists for the two Mixed treatments involved one group of conceptually-related stimuli and one group of unrelated stimulus pictures; i.e., the animal pictures were combined with one of the unrelated stimulus groups for the first list and the vegetable pictures were combined with the second unrelated stimulus group for the second list. The star was pasted on the back of the instances of the conceptually-related pictures for the First-Mixed treatment and on the back of the unrelated stimulus pictures for the Second-Mixed treatment. Finally, the lists for Unrelated treatment consisted of two groups of three unrelated stimuli and the star was pasted on the back of one of the stimulus groups to form the two lists.

Procedure

Children were tested individually for 20 to 25 minutes. Half the subjects in each treatment were given a training or "priming" task followed by the discrimination task and then the free recall trial.

For the priming task, the pictures were randomly placed on the table in front of S with instructions to "put all of the pictures that go together in this box (E pointed to one of two small boxes) and all the other pictures that go together in that box (E pointed to the second box)." The pictures were then exposed individually for sorting, with Ss being corrected after each error. After each trial the S was asked why the pictures in each box were put together. If the S did not answer, the question was rephrased as follows: "What are all these pictures in this box?" If the S labeled the conceptual category, the E agreed. If the S did not provide the correct answer or failed to answer, the E said, "All these are pictures of animals, that is why we put them together. They are all animals and go together." The procedure for the Unrelated treatment emphasized the two stimulus groups but Ss were not asked to provide a verbal label. After each trial for all treatments the pictures were taken out of the box, spread in groups of three in front of the S and he was told "See, all these pictures go together so we put them in the same box." The Ss sorted the pictures to a criterion of one errorless trial.

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The discrimination task was prefaced by the following instructions: "I have made a game with the same pictures that we put in the boxes. I hid a star on the back of some of the pictures but not on the back of all the pictures. I will show the pictures one at a time and I want you to say if there is a star on the back of the picture. Then we will turn the card over and see if you were right." An example was given with two pictures of geometrical shapes to familiarize the S with the procedure. The criterion on the discrimination task was two consecutive errorless trials. Following criterion

on the discrimination task, a free recall trial was given in which Ss were asked to recall all of the pictures which had been seen.

The procedure for Ss assigned to the No Priming condition was identical to that of the Priming condition except that the pretraining task was omitted. All tasks were unpaced and pictures were exposed to Ss in a different random order for each trial in the priming and discrimination phases.

Results

Table 1 provides summary data for errors in criterion on the priming task (available only from Ss assigned to the Priming treatment) and the discrimination task. Means are also presented for the numbers of items recalled on the free recall test. The means are presented separately for the starred (S) and non-starred (N) items in each list. No sex differences were observed and the data were pooled for boys and girls.

Insert Table 1 about here

Priming

The data for errors to criterion were analyzed in a 4 (Type of List) x 2 /Stimulus Grouping (S,N)/ factorial design. Stimulus Grouping was a "dummy" variable in this analysis since items were not identified as starred or non-starred until practice on the discrimination task was initiated. The analysis indicated statistical significance for the main effect of Type of List, $F(3,36) = 5.41$, $p < .005$, with means of 2.90, 8.40, 1.60, and 3.50, for the Conceptual, Unrelated, First-Mixed and Second-Mixed treatments, respectively. Contrasts among the list means revealed that the Unrelated list was more

difficult than each of the remaining three treatments (ps < .01), indicating that the children did use the conceptual groupings in acquisition. No other contrasts approached significance. As expected, the main effect for Stimulus Grouping and the interaction did not approach statistical significance, Fs < 1.23.

Discrimination Learning

The mean trials to criterion for Non-primed Ss in discrimination learning for the Conceptual, Unrelated, First-Mixed, and Second-Mixed treatments were 13.1, 24.6, 19.3, and 19.4, respectively. The comparable data for Primed Ss were 11.2, 22.5, 13.4, and 11.9. The statistical analysis revealed significance for the main effects of Type of List, $F(3, 72) = 6.33$, $p < .001$ and Priming, $F(1, 72) = 5.24$, $p < 01$. but not for the interaction, $F < 1$.

Within-list performance differences were also of interest, i.e., the relative errors for starred and non-starred items and for conceptually-related and unrelated items were compared. Table 1 provides the mean errors to criterion for starred and non-starred items for each list in discrimination learning. The analysis for errors to criterion revealed fewer errors for starred items than for non-starred items, $F(1, 72) = 36.55$, $p < .001$. This difference was apparent across each of the four lists, whether the starred items were from a conceptually-related set (Conceptual and First-Mixed treatments) or from an unrelated set (Unrelated and Second-Mixed treatments) of items. Statistical significance was also found for the main effect of Type of List, $F(3, 72) = 6.58$, $p < .001$, with means of 24.4, 54.4, 37.7, and 31.8 for the Conceptual Unrelated, First-Mixed, and Second-Mixed treatments, respectively. Statistical contrasts indicated fewer errors for the Conceptual treatment than for both Mixed treatments

(ps < .05) and that performance in the Unrelated treatment was inferior to each of the remaining three lists, ps < .01. The main effect for Priming was not statistically significant, $F(1,72) = 1.97$, $p < .20$, although slightly fewer errors were observed for Ss assigned to the Priming treatment (see Table 1). No other main effects nor interactions approached statistical significance.

Free Recall

Table 1 provides means for the number of items recalled for each treatment on the free recall test. The main effects for Type of List, $F(3,72) = 2.40$, and Priming, $F(1,72) = 2.91$, were not statistically significant. However, the interaction between Type of List and Stimulus Grouping was significant, $F(,72) = 3.99$, $p < .05$. As is evident from Table 1, more items were recalled from the stimulus groups which were conceptually related. This is apparent for the data from the two Mixed treatments (which contained one conceptually-related and one unrelated stimulus group in the list). Performance for the Conceptual treatment was also superior to that for the Unrelated treatment but as expected, the means did not differ for the two stimulus groupings within either treatment. No other main effects nor interactions were significant in this analysis.

Discussion

The data provided clear evidence that the children used the conceptual cues in learning on both the pretraining and discrimination tasks. Moreover, the differences in performance on the discrimination task between the Conceptual treatment and the two Mixed treatments revealed that the presence of two conceptual cues (one for each stimulus set) facilitated performance. This was true even though the functional requirements for mastery of the discrimination list in the Conceptual and Mixed treatments minimally demanded attention to only one of the stimulus sets within the list. The appropriate response to the remaining stimulus group would then be known by exclusion. These data thus confirm other findings (Goulet and Williams, 1970) that young children have difficulty with such types of inferences.

The within-list performance differences for starred and non-starred items in the discrimination task were also of interest. Fewer errors occurred for starred items whether these items were conceptually related or unrelated. This is most easily seen when the performance on starred and non-starred items is contrasted for the First-Mixed and Second-Mixed treatments. These data suggest that the children used the star cues in the discrimination task quite independently of the conceptual cues available in the list, even though the data for trials to criterion and within-list errors suggest that both types of cues were used in learning. Superior performance in free recall was evidenced for conceptually-related items whether these items were starred (First-Mixed treatment) or not (Second-Mixed treatment).

These patterns of results suggest that the children, while using each of the types of cues in learning, did not use them together, either as compound

cues to differentiate one stimulus set from another (as in the First-Mixed treatment) or to assist them in differentiating between the conceptual and unrelated stimulus sets (as in the Second-Mixed treatment).

The present data also indicated that the children used the mediators in free recall (as evidenced by the greater recall of items in the conceptually-related stimulus groups) in the Conceptual and Mixed treatments. These results are especially interesting because of the indication that the children transfer and use mediators in new tasks, i.e., tasks even to which they were not exposed in the experimental situation.

Taken together, the data fr discrimination learning and free recall imply that the children can use multiple cues as aids in learning as long as the cues are taken from the same dimension, i.e., in the Conceptual treatment the children used both conceptual cues to advantage on both discrimination learning and free recall tasks. However, the data from the First-Mixed and Second-Mixed treatments suggest that the children did not use the conceptual and star cues jointly as aids in discrimination learning. On a positive note, however, the transfer of mediators to free recall occurred whether or not the conceptually-related stimuli had been associated with a star in discrimination learning.

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Footnotes

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Table 1

Summary Data for Performance in Pretraining, Discrimination and Free Recall

		Lists							
		Priming				No priming			
		Conceptual	Unrelated	First-Mixed	Second-Mixed	Conceptual	Unrelated	First-Mixed	Second-Mixed
		Pretraining (Errors to Criterion)							
Type of item	S	1.5	4.4	0.6	1.9	---	---	---	---
	U	1.4	4.0	1.0	1.6	---	---	---	---
		Discrimination (Errors to Criterion)							
Type of item	S	8.1	24.1	10.7	9.9	9.6	25.0	14.9	16.8
	U	17.0	29.3	20.7	15.1	14.1	30.4	29.1	21.8
		Free Recall (Mean Correct Responses)							
Type of item	S	2.4	1.7	2.5	1.6	1.9	1.6	2.1	1.2
	U	2.2	1.6	2.0	2.3	2.0	2.0	1.7	2.0